Demand Response Hardware and Tariffs: California's Vision and Reality

PIER DR Symposium
November 30, 2004

Art Rosenfeld

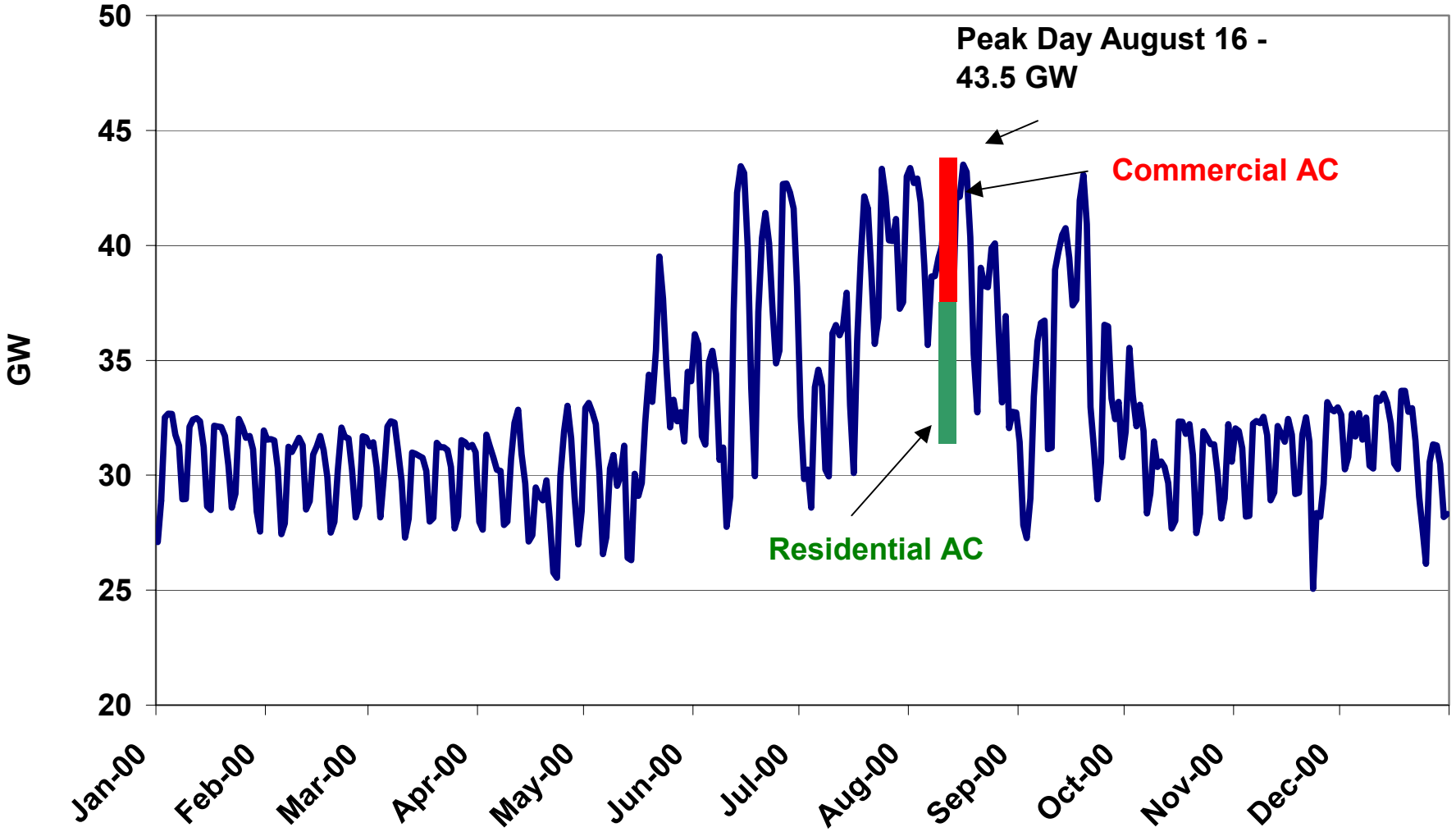
California Energy Commission

arosenfel@energy.state.ca.us

916.654.4930

Cal ISO Daily Peak Loads

January 1, 2000 - December 31, 2000



DR Policy

- Joint Proceeding – CPUC and CEC
  - Peevey, Rosenfeld and McPeak
- Working Group 2 > 200 kW
  - All have interval meters and TOU tariff
  - 20 MW on CPP tariff
- Working Group 3, Residential and Small Commercial
  - 2,500 customers in a Statewide Pricing Pilot (SPP)
- Utility Business Plans for Automated Meter Infrastructure
  - In preliminary filings (Oct. 04), PG&E and Sempra appear favorable toward AMI; SCE disinclined
- Goal: ~ 1% per year = 5% 5 years after t=0

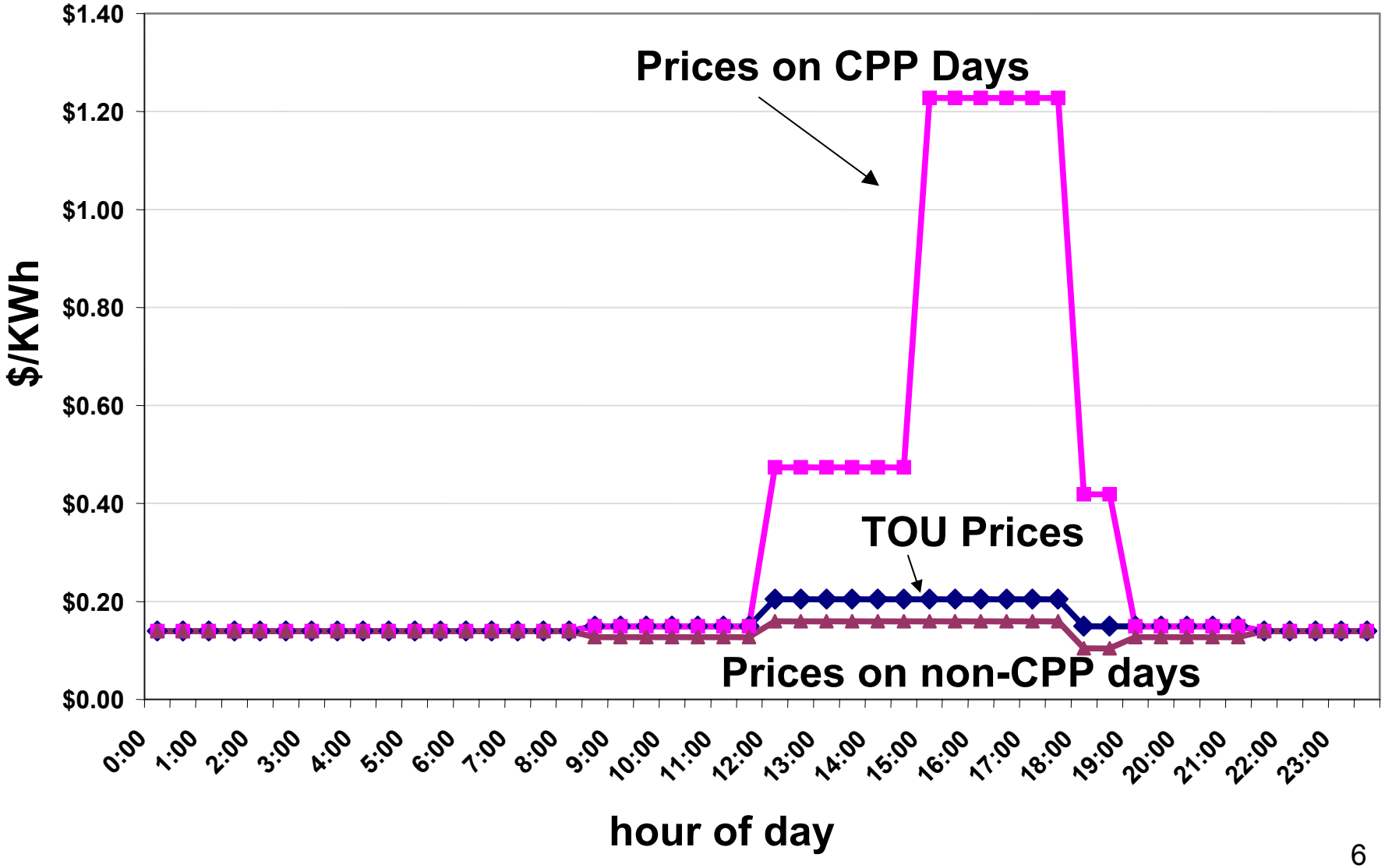
Vision

- If economic, customers should have a choice of the following rates:
- Residential and Small Commercial (< 200 kW)
  - Default: CPP
  - Options: TOU
- Large Customers (200 kW to 1 MW)
  - Default: CPP
  - Options: TOU, RTP
- Very Large Customers (> 1 MW)
  - Default: RTP
  - Options: TOU, CPP

DYNAMIC PRICING vs. TOU PRICES

- **Time-of-Use** (TOU) is typically 3 time blocks published in advance for entire season
  - Peak, Shoulder, Off-Peak
  - Can't foresee weather or equipment failures
- **Critical Peak Pricing** (CPP) is a high price imposed on a few days a year when energy is expensive or system conditions are critical or near critical
  - Non-CPP hours are less expensive as a result
  - Day-ahead notification offers additional time for response
- **Real-Time Pricing** (RTP) is hourly real-time marginal cost of a kWh
  - Reflects hot weather, scarcity, or equipment failure
  - Day ahead notification offers additional time for response

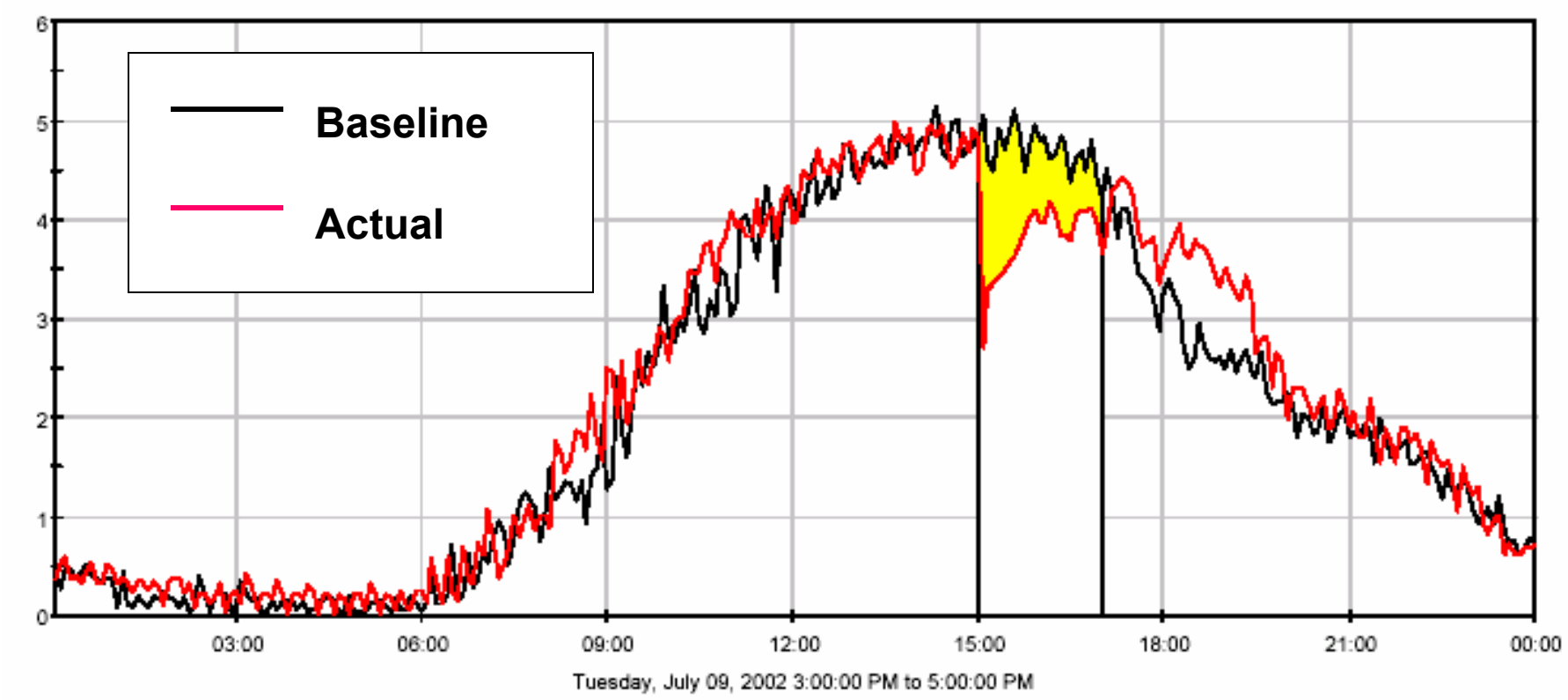
An Example of a CPP Tariff for Large Customers



Demand Response Programs/Tariffs
Investor Owned Utilities as of June 2004
MW Available

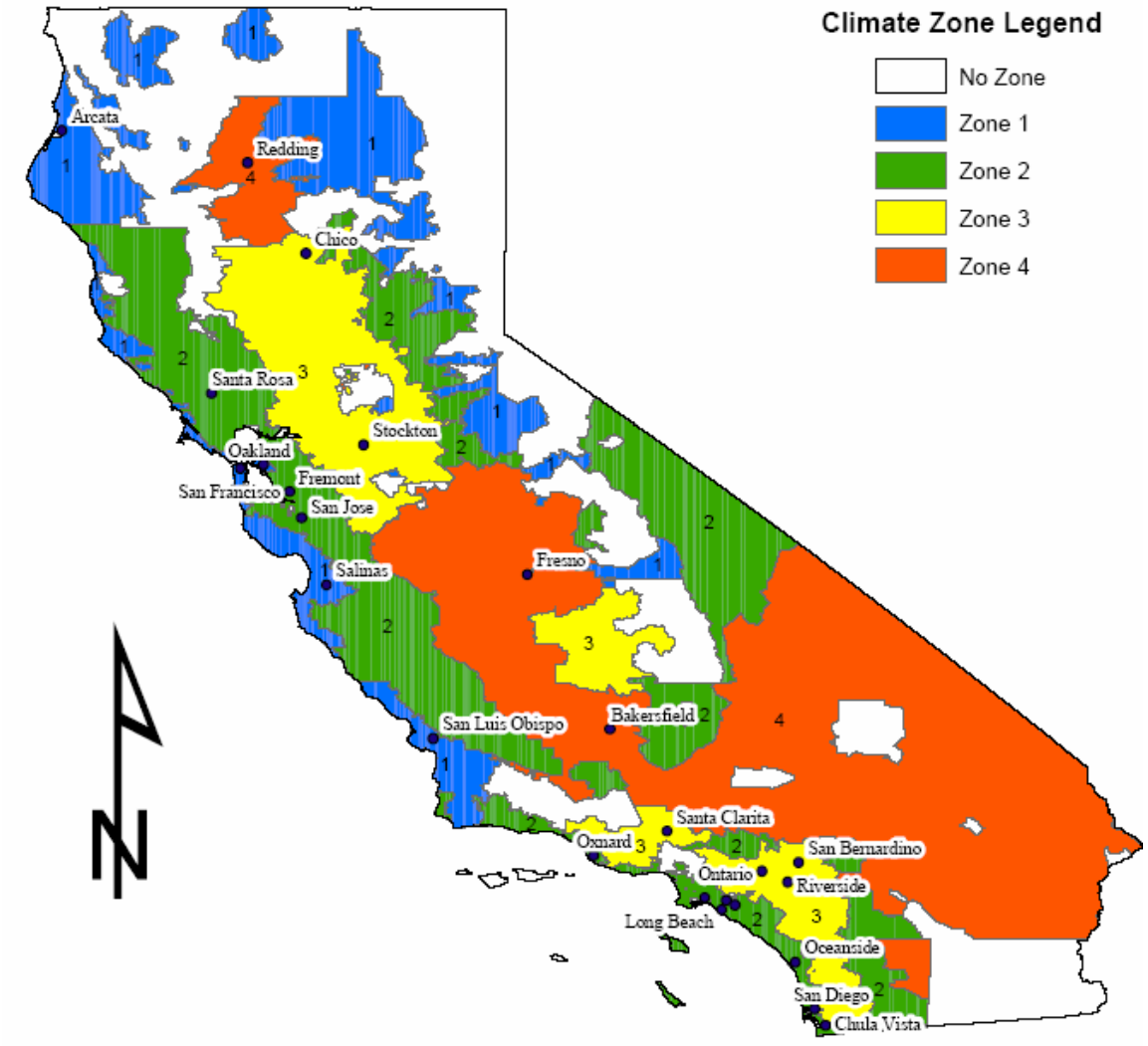
	SDGE	SCE	PGE	Total by Program
Interruptible/Curtailable	25	710	360	**1,095**
Demand Bidding	12	80	60	**152**
Critical Peak Pricing	7	1	8	**16**
Power Authority Demand Response	3	12	200	**215**
Air Conditioning Cyclers/Smart Thermostat	3	300	0	**303**
Backup Generators	60	0	0	**60**
Total by Utility	**110**	**1,103**	**628**	
		Grand Total		**1,841**

Example of Smart Thermostat Response for Small Commercial Cust. Thermostat Raised 4 deg. F.

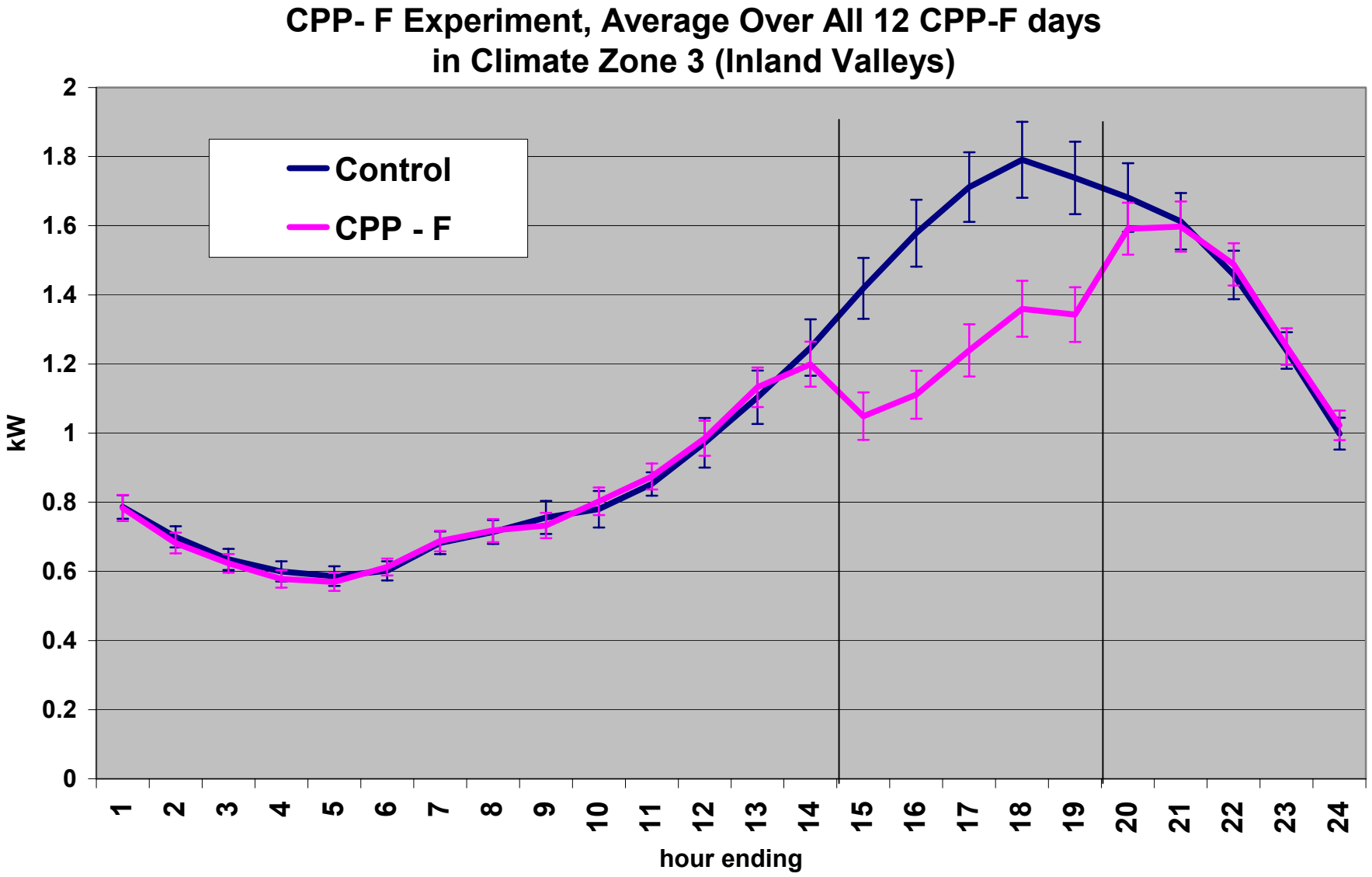


Source: Program Impact Evaluation of the 2002 SCE Energy $mart Thermostat Program Final Report, RLW Analytics, 2/28/2003

SPP climate zones vary from cool Zone 1 to very warm Zone 4

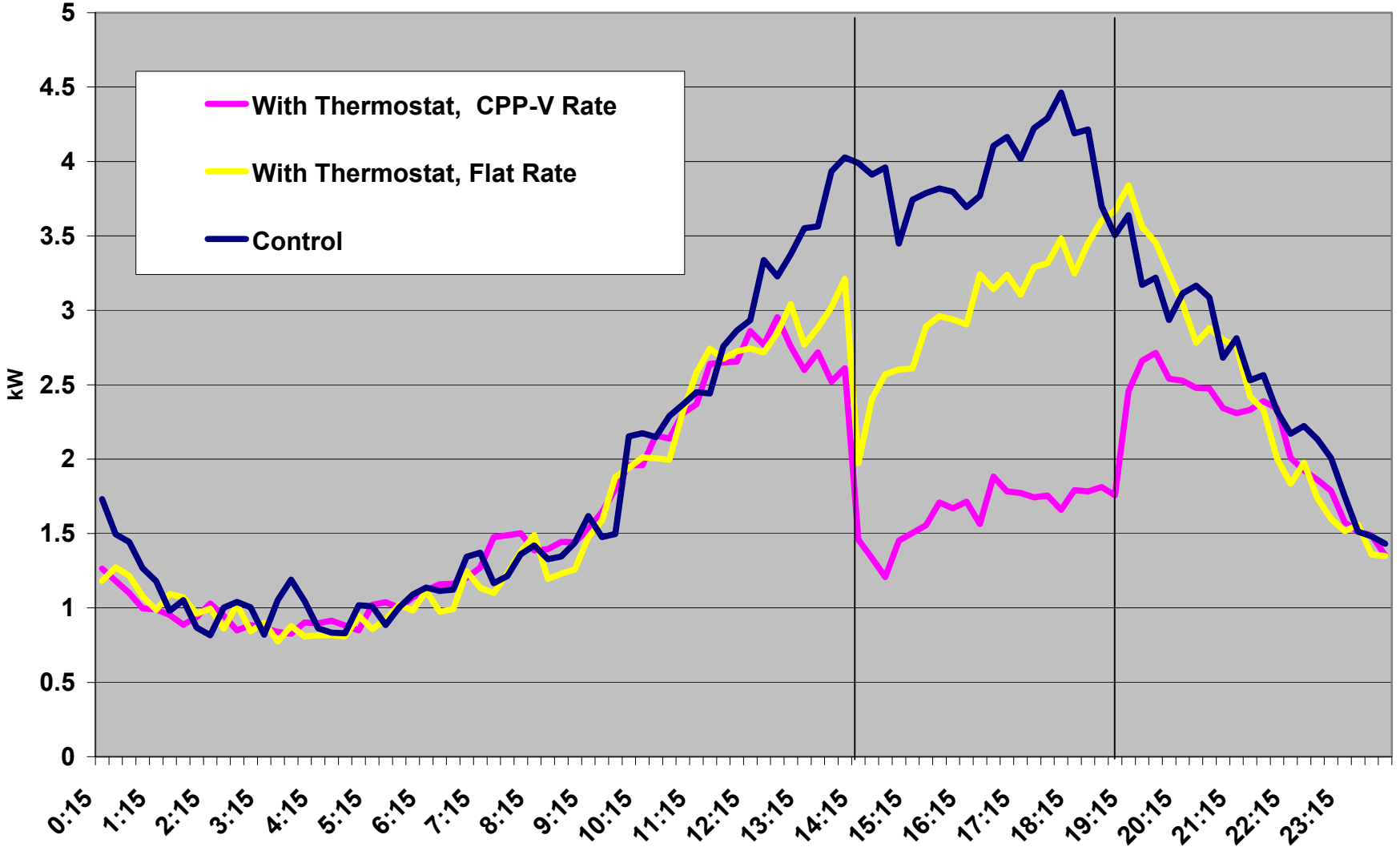


Source: CRA presentation, May 22 Chicago Pricing Conference


CPP- F Experiment, Average Over All 12 CPP-F days
in Climate Zone 3 (Inland Valleys)
Control
CPP - F
kW
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
hour ending

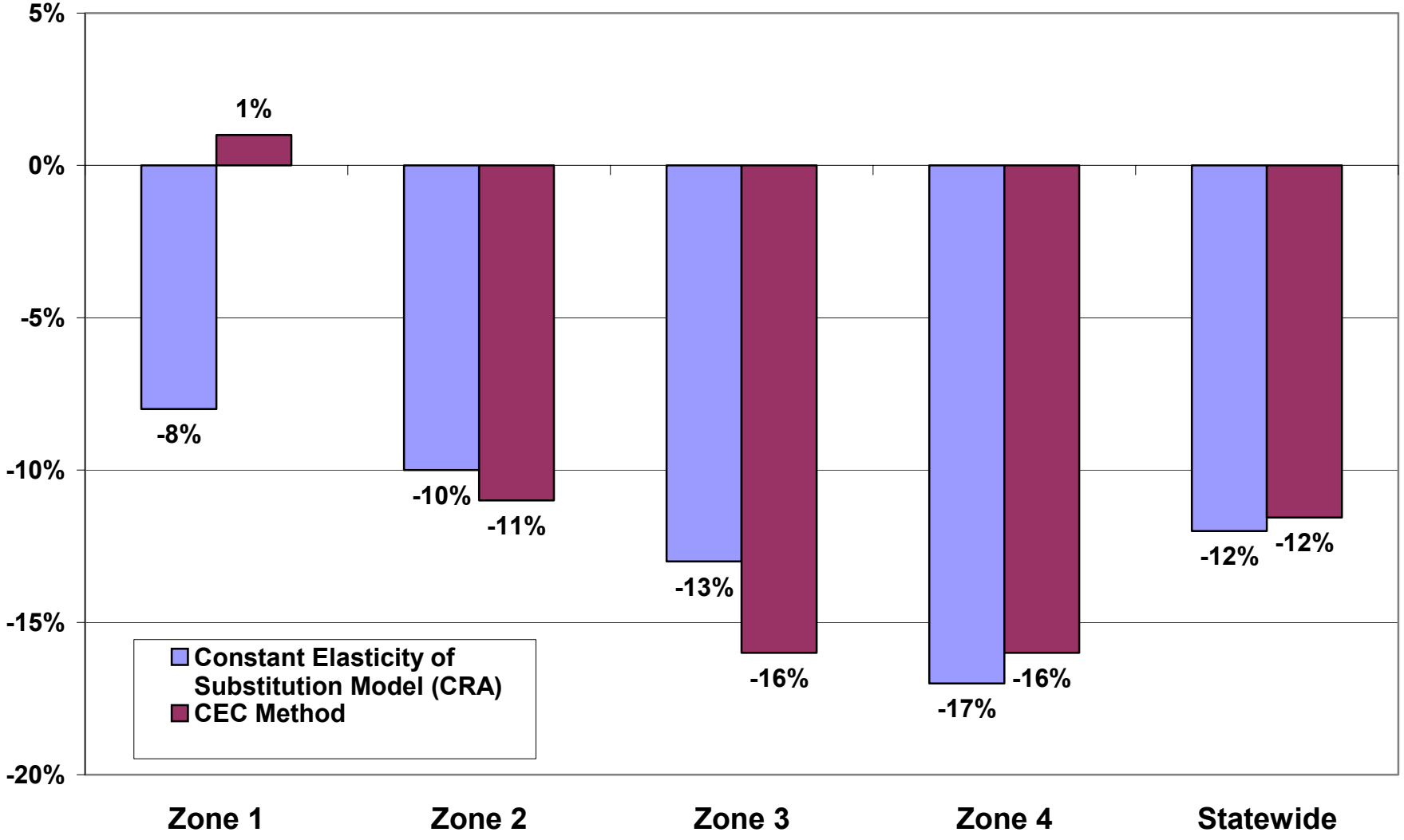
A Very Hot Day in San Diego

CPP-V Experiment in SDG&E
Results from August 15, 2003



The most current results

Change in Consumption during Peak Period for CPP_F customers on Critical Peak Days -- Summer 2003

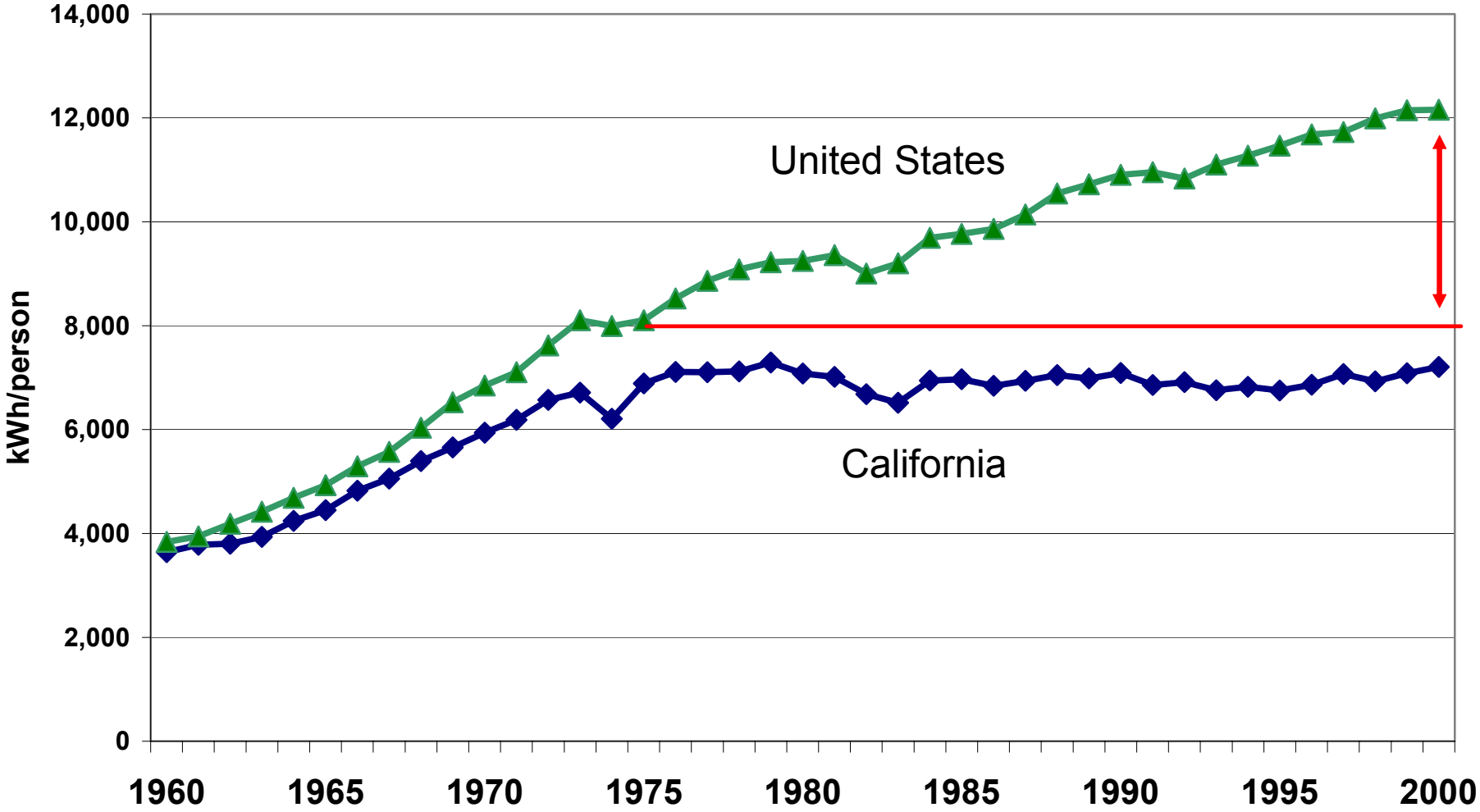


Next Steps

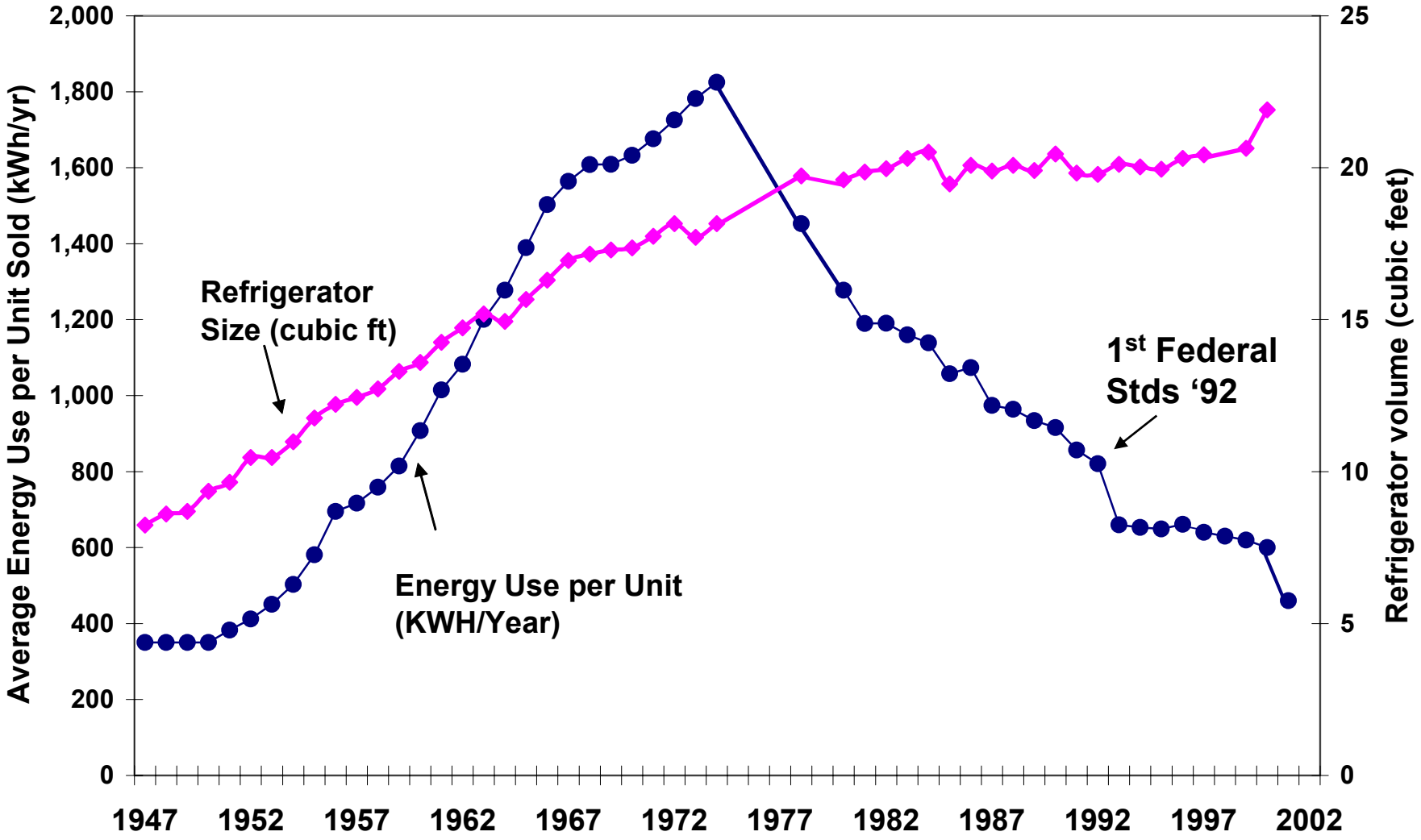
- Reference Designs (good for the next 20 years!)
  - Meters
  - Thermostats or User Interface
    - Communications and Programmability
    - Override capabilities (economic vs. reliability)
- Title 20 (Appliances, i.e. thermostats)
- Title 24 (New Buildings)
- Cost breakthrough for hardware and communications

Per Capita Electricity Consumption

Source: http://www.eia.doe.gov/emeu/states/sep_use/total/csv/use_csv.html

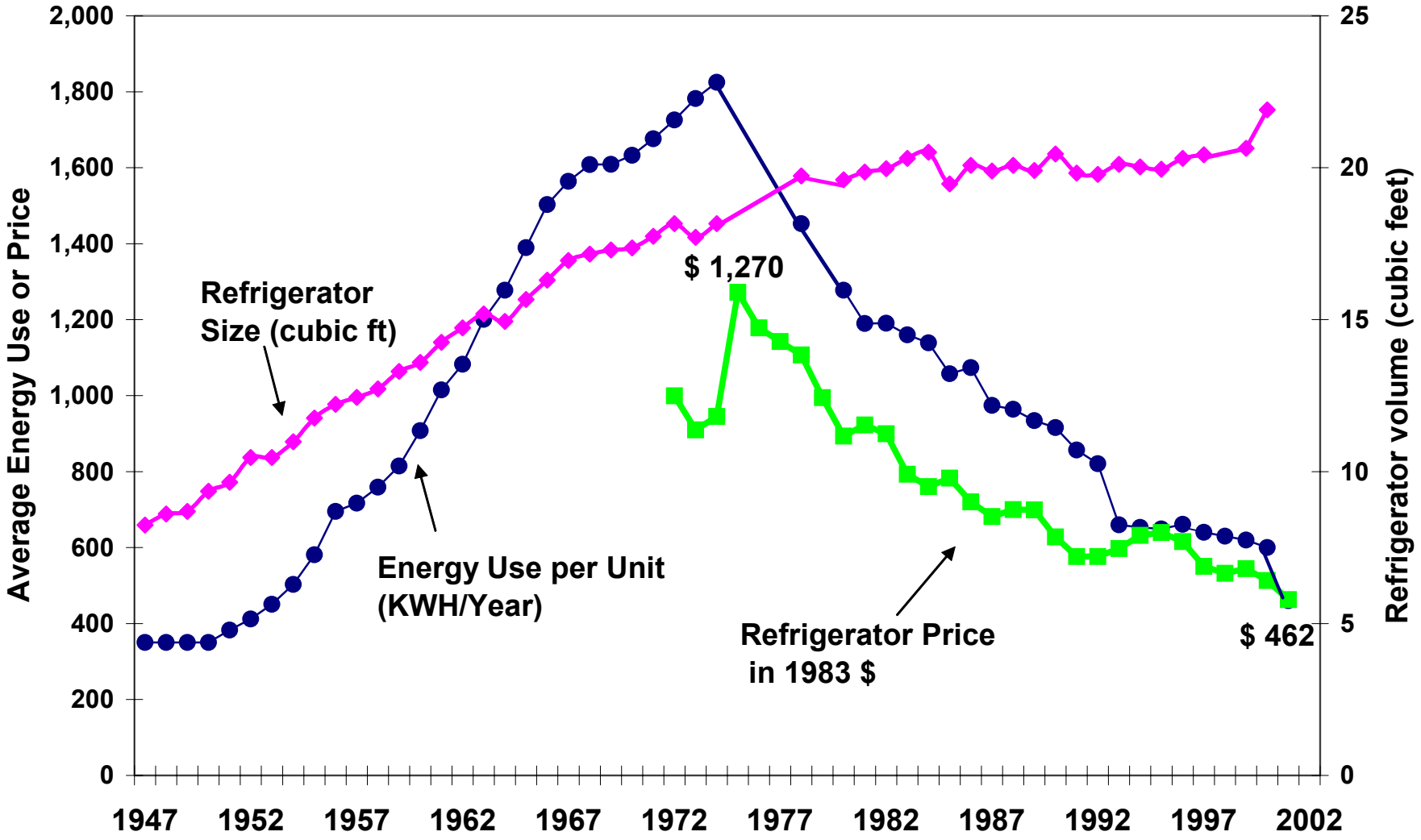


United States Refrigerator Use v. Time



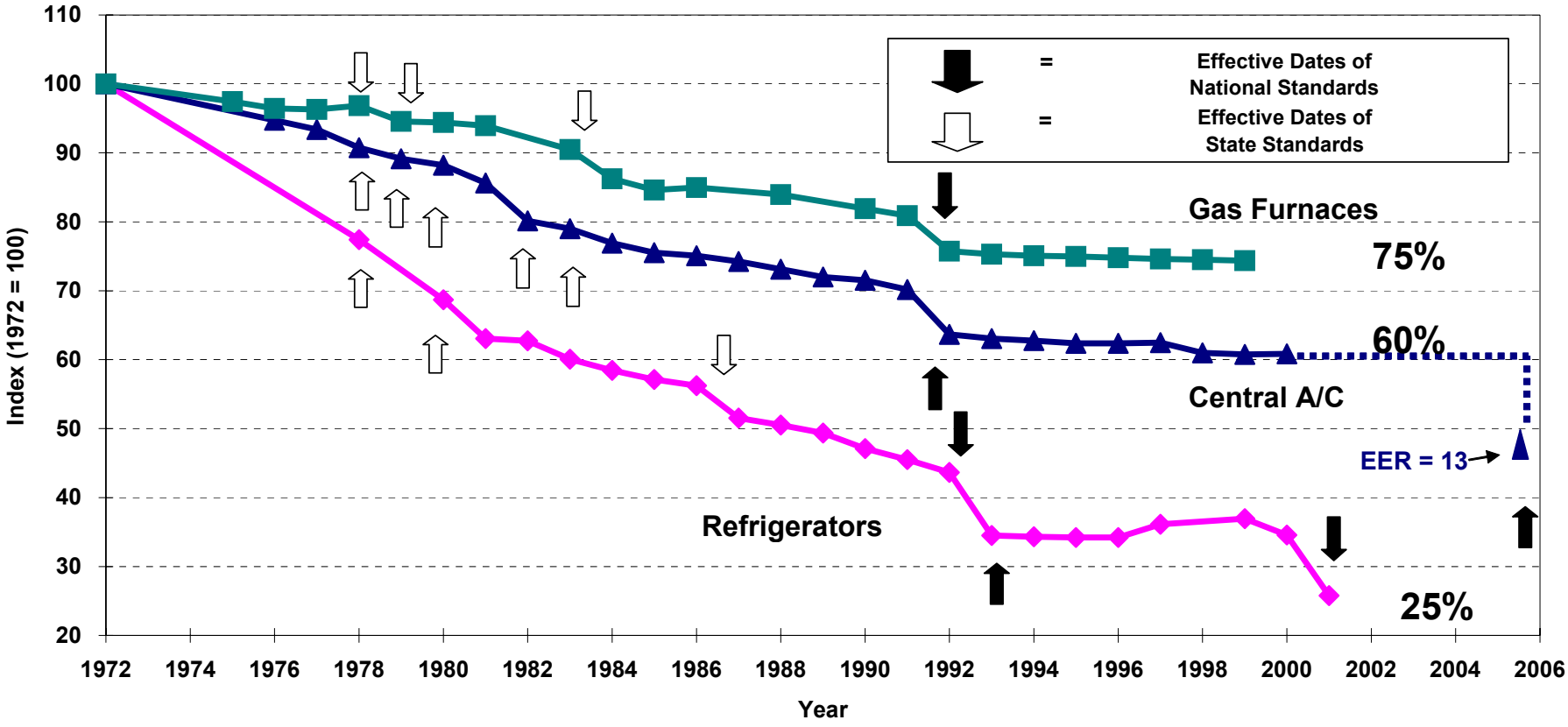
Source: David Goldstein

United States Refrigerator Use v. Time



Source: David Goldstein

Impact of Standards on Efficiency of 3 Appliances

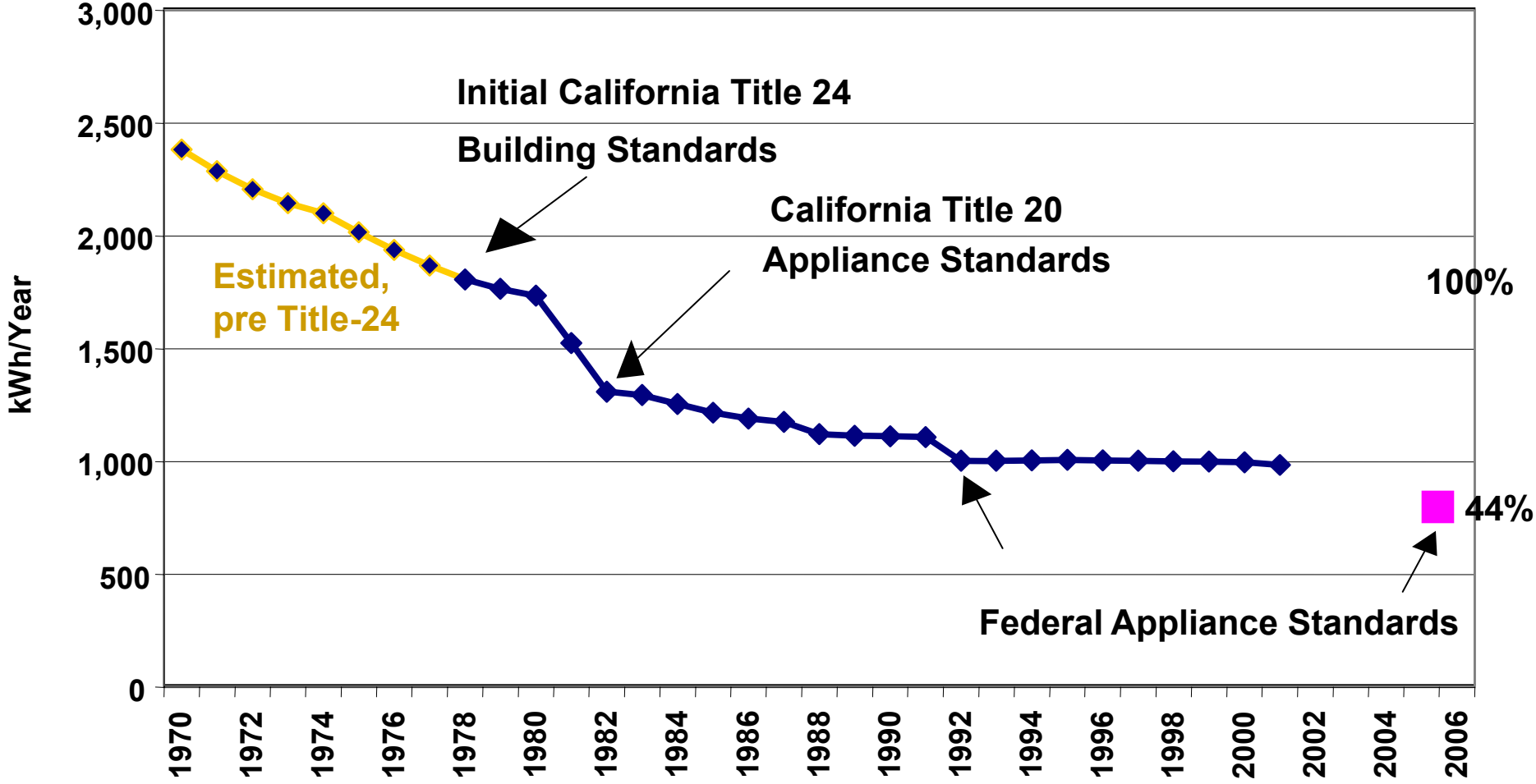


Source: S. Nadel, ACEEE,

in ECEEE 2003 Summer Study, www.eceee.org

Annual Usage of Air Conditioning in New Homes in California

Annual drop averages 3% per year; + House size grew 1% per year



Source: CEC Demand Analysis Office